



# Baidu Search: Challenges we face, Experiences we learned

Kaihua Zhu

[zhukaihua@baidu.com](mailto:zhukaihua@baidu.com)

Architect of Baidu Search

# Challenges for Modern Search Engine

Baidu 百度 刘德华老婆是谁

百度一下 直达

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约5,670,000个

刘德华妻子：  
**朱丽倩**

朱丽倩英文名字叫carol，1966年4月6日出生在马来西亚槟城，有5个兄弟姐妹。家境富裕，父亲做地产和酒楼生意。1984年她和姐妹参加当地的“新潮小姐”选美获得季军，之后赴... [详情 >](#)

来自百度百科 | 报错

为您推荐：刘德华女儿 刘德华身高 张学友妻子 周润发妻子 林志颖妻子

**刘德华老婆是谁\_百度图片 - 举报图片**

image.baidu.com 查看全部88,850张图片

**刘德华老婆是谁？百度知道**

5个回答 - 提问时间: 2013年01月18日

最佳答案: 朱丽倩 个人简介 中文名: 朱丽倩 英文名: carol 家乡: 祖籍福建诏安,生于马来西亚槟城 性别: 女 国籍: 马来西亚 ...  
zhidao.baidu.com/link?... 2013-01-18 - 80%好评

[刘德华现在的老婆是谁](#) 8个回答 2006-09-18

[刘德华的老婆是谁](#) 3个回答 2013-11-06

[更多知道相关问题>>](#)

**刘德华老婆\_刘德华老婆朱丽倩照片\_刘德华女儿照片\_星明网**

关于影视巨星刘德华的老婆是谁这在娱乐圈一直是个备受争议的话题，刘德华的老婆朱丽倩很少一起出现在公众面前，近日，朱丽倩与刘德华牵手现身吉隆坡机场，备受瞩目的朱...  
www.xingshu.com/zhuant... 2013-12-12 ▼2

**刘德华老婆是谁?刘德华老婆朱丽倩个人信息及女儿照片\_婚姻城堡...**

2013年12月21日 - 刘德华是中国香港演员、歌手,是四大天王之一,关于刘德华老婆是谁,是粉丝们关注的话题,小编分享了演员刘德华老婆

相关人物

李晨 黄秋燕 刘向蕙 angelababy

内地男演员 李连杰的前妻 天王与朱丽倩的爱女 新生代四小花旦之一

周润发 张学友 张国荣复活 黄飞鸿

永远的发哥 歌神香港四大天王之一 网传哥哥非自杀是隐身 武术界的一代宗师

林凤娇 向华强 张敏 林心如

成龙的妻子 中国星集团主席 一代男影迷的梦中情人 因还珠夏紫薇一炮走红

展开 ▾

其他人物还搜

给百度提建议

Model relevance better

# Challenges for Modern Search Engine

Provide answer directly

Baidu 百度 刘德华老婆是谁

百度一下 直达

百度为您找到相关结果约5,670,000个

刘德华妻子：  
**朱丽倩**

朱丽倩英文名字叫carol，1966年4月6日出生在马来西亚槟城，有5个兄弟姐妹。家境富裕，父亲做地产和酒楼生意。1984年她和姐妹参加当地的“新潮小姐”选美获得季军，之后赴... [详情 >](#)

为您推荐：刘德华女儿 刘德华身高 张学友妻子 周润发妻子 林志颖妻子

[刘德华老婆是谁\\_百度图片 - 举报图片](#)

image.baidu.com 查看全部88,850张图片

**刘德华老婆是谁？百度知道**

5个回答 - 提问时间: 2013年01月18日

最佳答案: 朱丽倩 个人简介 中文名: 朱丽倩 英文名: carol 家乡: 祖籍福建诏安,生于马来西亚槟城 性别: 女 国籍: 马来西亚 ...  
[zhidao.baidu.com/link?... 2013-01-18](#) - 80%好评

**刘德华现在的老婆是谁** 8个回答 2006-09-18  
**刘德华的老婆是谁** 3个回答 2013-11-06  
[更多知道相关问题>>](#)

**刘德华老婆\_刘德华老婆朱丽倩照片\_刘德华女儿照片\_星明网**

关于影视巨星刘德华的老婆是谁这在娱乐圈一直是个备受争议的话题，刘德华的老婆朱丽倩很少一起出现在公众面前，近日，朱丽倩与刘德华牵手现身吉隆坡机场，备受瞩目的朱...  
[www.xingshu.com/zhuant... 2013-12-12](#) **v2**

**刘德华老婆是谁?刘德华老婆朱丽倩个人信息及女儿照片\_婚姻城堡 ...**

2013年12月21日 - 刘德华是中国香港演员、歌手,是四大天王之一,关于刘德华老婆是谁,是粉丝们关注的话题,小编分享了演员刘德华老婆

相关人物

李晨  
内地男演员

黄秋燕  
李连杰的前妻

刘向蕙  
天王与朱丽倩的爱女

angelababy  
新生代四小花旦之一

展开 ▼

周润发  
永远的发哥

张学友  
歌神香港四大天王之一

张国荣复活  
网传哥哥非自杀是隐身

黄飞鸿  
武术界的一代宗师

其他人物还搜

林凤娇  
成龙的妻子

向华强  
中国星集团主席

张敏  
一代男影迷的梦中情人

林心如  
因还珠夏紫薇一炮走红

Model relevance better

# Challenges for Modern Search Engine

Provide answer directly

The screenshot shows the Baidu search interface for the query "刘德华老婆是谁". The top result is a direct answer card: "刘德华妻子: 朱丽倩". Below it is a summary of her biography, a photo of her, and a link to the full profile. A red box highlights this top result. Further down, there are sections for "刘德华老婆是谁\_百度图片" (Baidu Images) showing several photos of her, and "刘德华老婆是谁\_百度知道" (Baidu Zhihu) with Q&A threads. Another red box highlights the image section.

Guide user thoroughly

The screenshot shows the Baidu search interface for the query "周润发". The top result is a detailed百科 (encyclopedia) card for "周润发". It includes a photo, basic information, and a summary of his career. A red box highlights this top result. Below it is a "相关人物" (Related Figures) section with cards for "张丰毅" (Zhang Fengyi), "黄秋燕" (Huang Chuiyan), and "李连杰的前妻" (Former wife of Li Lianjie). Further down, there are sections for "周润发的电影" (Chow Yun-fat's movies) showing movie posters and ratings, and "周润发的最新相关信息" (Latest information about Chow Yun-fat). A red box highlights the movie section.

Model relevance better

# Challenges for Modern Search Engine

---

- Model relevance better
- Provide answers directly
- Guide users thoroughly

# Challenges for Modern Search Engine

---

- Model relevance better
- Provide answers directly
- Guide users thoroughly

# Challenge 1: Model relevance better

---

Model relevance with more representation capability!

# BM25: representation capability baseline

Keyword hits:

Exactly matched terms have positive contribution.

Term weighting:

Model the contribution of term-hit using TF-IDF

Okapi weighting based document score: [23]

$$\sum_{t \in Q, D} \ln \frac{N - df + 0.5}{df + 0.5} \cdot \frac{(k_1 + 1)tf}{(k_1(1 - b) + b \frac{dl}{avdl}) + tf} \cdot \frac{(k_3 + 1)qtf}{k_3 + qtf}$$

$k_1$  (between 1.0–2.0),  $b$  (usually 0.75), and  $k_3$  (between 0–1000) are constants.

Pivoted normalization weighting based document score: [30]

$$\sum_{t \in Q, D} \frac{1 + \ln(1 + \ln(tf))}{(1 - s) + s \frac{dl}{avdl}} \cdot qtf \cdot \ln \frac{N + 1}{df}$$

$s$  is a constant (usually 0.20).

Doc length normalization:

Not exactly matched terms all have negative contribution.

# Evolution of IR: increasing representation capability

---

- Q: A B C D E  
D: X Ā B Y C D' Z  
(B C are exactly matched terms: already covered in BM25)
- How to model “not exactly matched terms” is the key of evolution
  - Normalized hits
  - Synonym hits
  - Term-term “like” relationship
  - Phrase-term “like/hate” relationship

# Evolution of IR: increasing representation capability

---

- Q: A B C D E  
D: X Ā B Y C D' Z  
(B C are exactly matched terms: already covered in BM25)
- How to model “not exactly matched terms” is the key of evolution
  - Normalized hits (A ->(1.0) Ā): stemming, spelling correction, C2C, date / number
    - ✧ Stemming: biking -> bike; apples -> apple; tested -> test
    - ✧ Spelling correction: briteny -> britney
    - ✧ C2C conversion: 怎麼 -> 怎么; 天氣 -> 天气
    - ✧ Date / Number normalization: 二月一日 -> 2月1日; 三岁 -> 3岁

# Evolution of IR: increasing representation capability

---

- Q: A B C D E

D: X  $\bar{A}$  B Y C D' Z

(B C are exactly matched terms: already covered in BM25)

- How to model “not exactly matched terms” is the key of evolution

  - Normalized hits (A  $\rightarrow$ (1.0)  $\bar{A}$ )

  - Synonym hits (D  $\rightarrow$ (0.8) D'): inter-changeable terms with same meaning

    - Car  $\rightarrow$  Auto

baby child

    - Context free synonym: 宝宝  $\rightarrow$ (0.9) 小孩

    - Context dependent synonym: 初中2013级学业水平测试：级  $\rightarrow$ (0.85) 年级; 年; 届

    - Multi-term synonym: 苹果□手机  $\rightarrow$ (0.7) iphone; 多少□钱  $\rightarrow$ (0.8) 报价 | 价格

Apple phone

How much

price

# Evolution of IR: increasing representation capability

---

- Q: A B C D E  
D: X  $\bar{A}$  B Y C D' Z  
(B C are exactly matched terms: already covered in BM25)
- How to model “not exactly matched terms” is the key of evolution
  - Normalized hits (A  $\rightarrow$ (1.0)  $\bar{A}$ )
  - Synonym hits (D  $\rightarrow$ (0.8) D')
  - Term-term “like” relationship (E  $\rightarrow$ (+0.2) X; E  $\rightarrow$ (+0.05)Y; E  $\rightarrow$ (+0.03) Z)

# Term-term “like” relationship

- Statistical machine translation model (Microsoft: Gao et al. 2010, 2011)

$q$	$P(q w)$	$Q$	$P(q w)$
titanic	0.56218	Vista	0.80575
ship	0.01383	Windows	0.05344
movie	0.01222	Download	0.00728
pictures	0.01211	ultimate	0.00571
sink	0.00697	xp	0.00355
facts	0.00689	microsoft	0.00342
photos	0.00533	bit	0.00286
rose	0.00447	compatible	0.00270
people	0.00441	premium	0.00244
survivors	0.00369	free	0.00211

$w = \text{titanic}$        $w = \text{vista}$

Using SMT model to memorize “like” relationship.

$q$	$P(q w)$	$q$	$P(q w)$
everest	0.52826	pontiff	0.17288
mt	0.02672	pope	0.09831
mount	0.02117	playground	0.03729
deaths	0.00958	wally	0.03053
person	0.00598	bartlett	0.03051
summit	0.00503	current	0.02712
climbing	0.00454	quantum	0.02373
cost	0.00446	wayne	0.02372
visit	0.00441	john	0.02034
height	0.00397	stewart	0.02031

$w = \text{everest}$        $w = \text{pontiff}$

# Evolution of IR: increasing representation capability

---

- Q: A B C D E  
D: X  $\bar{A}$  B Y C D' Z  
(B C are exactly matched terms: already covered in BM25)
- How to model “not exactly matched terms” is the key of evolution
  - Normalized hits (A  $\rightarrow$ (1.0)  $\bar{A}$ )
  - Synonym hits (D  $\rightarrow$ (0.8) D')
  - Term-term “like” relationship (E  $\rightarrow$ (+0.2) X; E  $\rightarrow$ (+0.05)Y; E  $\rightarrow$ (+0.03) Z)

All these works are modeling “like”!

Same model: A list of “liked” terms, each associated with “likeness” score

Limitation: the list can not be too long.

# Evolution of IR: increasing representation capability

---

- Q: A B C D E  
D: X  $\bar{A}$  B Y C D' Z  
(B C are exactly matched terms: already covered in BM25)
- How to model “not exactly matched terms” is the key of evolution
  - Normalized hits (A  $\rightarrow$ (1.0)  $\bar{A}$ )
  - Synonym hits (D  $\rightarrow$ (0.8) D')
  - Term-term “like” relationship (E  $\rightarrow$ (+0.2) X; E  $\rightarrow$ (+0.05)Y; E  $\rightarrow$ (+0.03) Z)
  - Phrase-term “like/hate” relationship ( [C D E]  $\rightarrow$ (-0.2) X; [D E]  $\rightarrow$ (+0.3) Z)

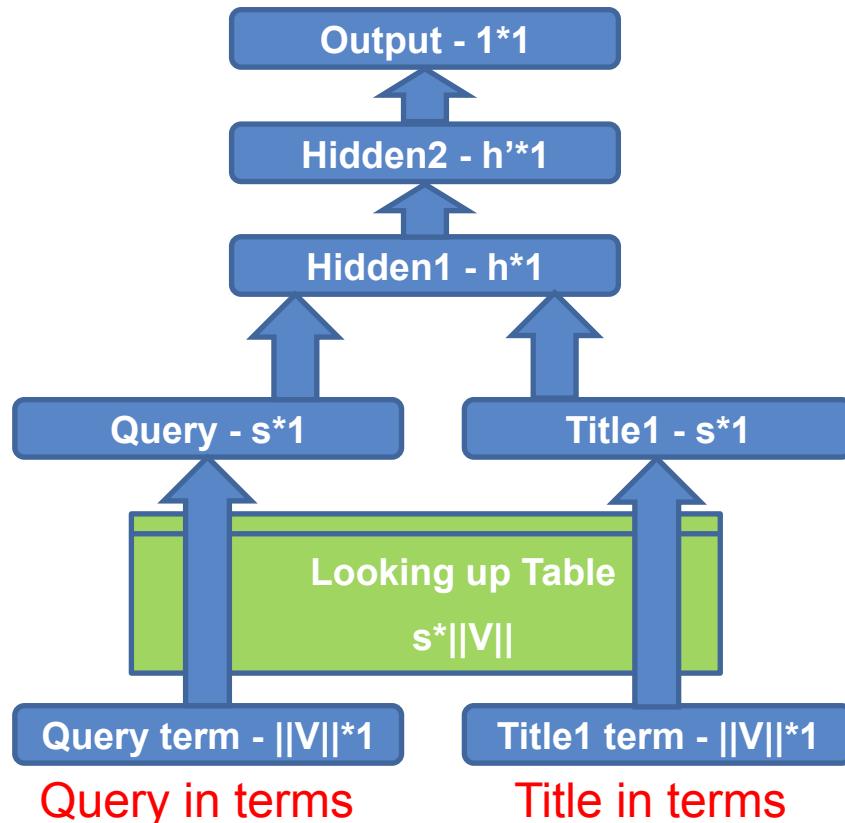
# Phrase-term “like/hate” relationship

---

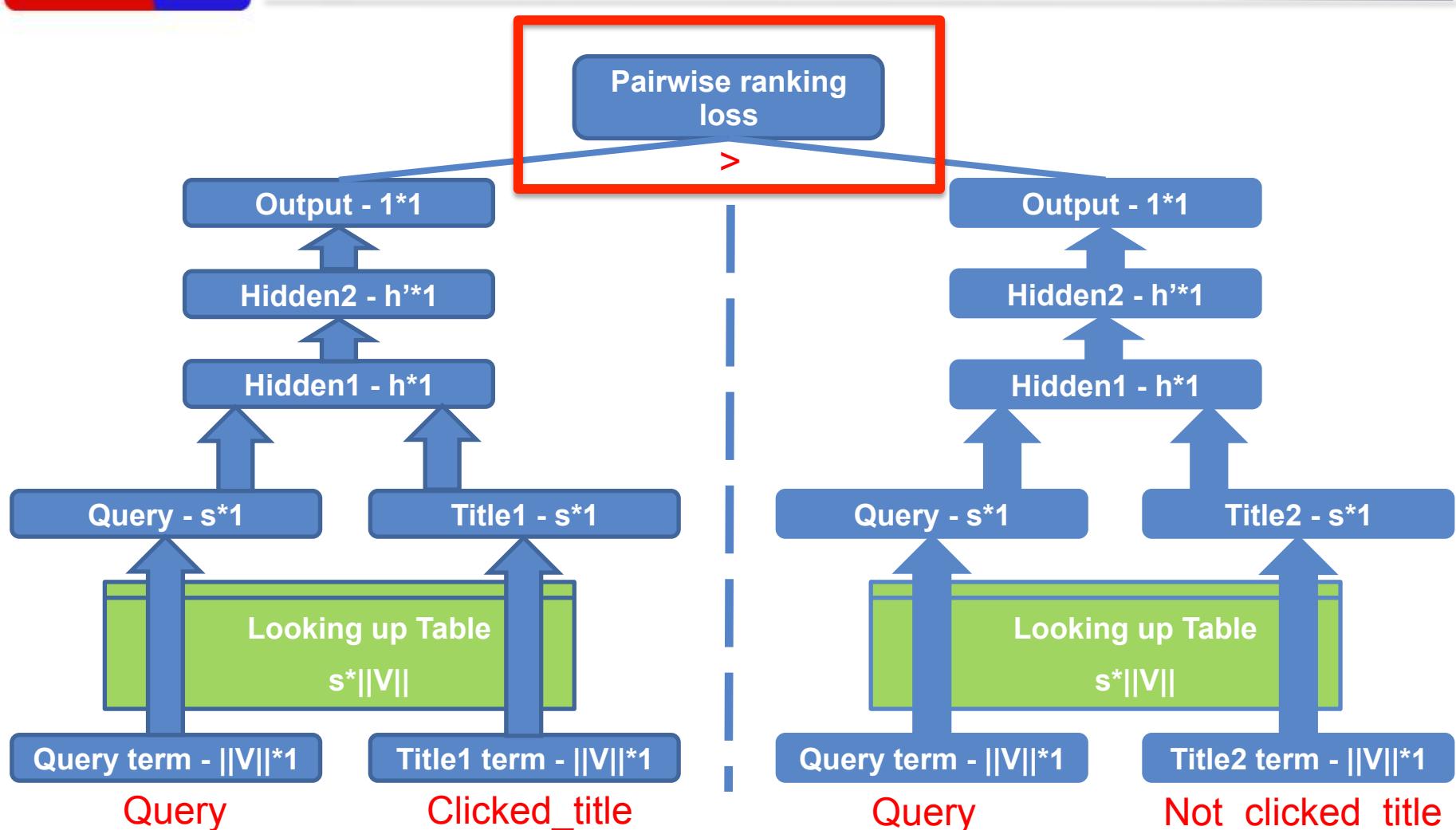
- Baidu's DNN model:
  - Using word embedding to model “like/hate” relationship
  - Using 10B user's clicks to train DNN model (more than 100M parameters)
  - Use DNN's prediction as a high level feature, feed into GBDT model which combine all high level features and trained by human labels
  - First DNN model launched in Dec 2013, launched 3 improved DNN models in 2014
    - ✧ Accounted for 34% of whole year relevance improvement in 2013
    - ✧ Accounted for 25% of whole year relevance improvement in 2014
  - (As far as we know) Baidu is the first company to launch DNN in web search!

# Baidu's DNN model: increasing representation capability

Relevance prediction between  
Query and Title

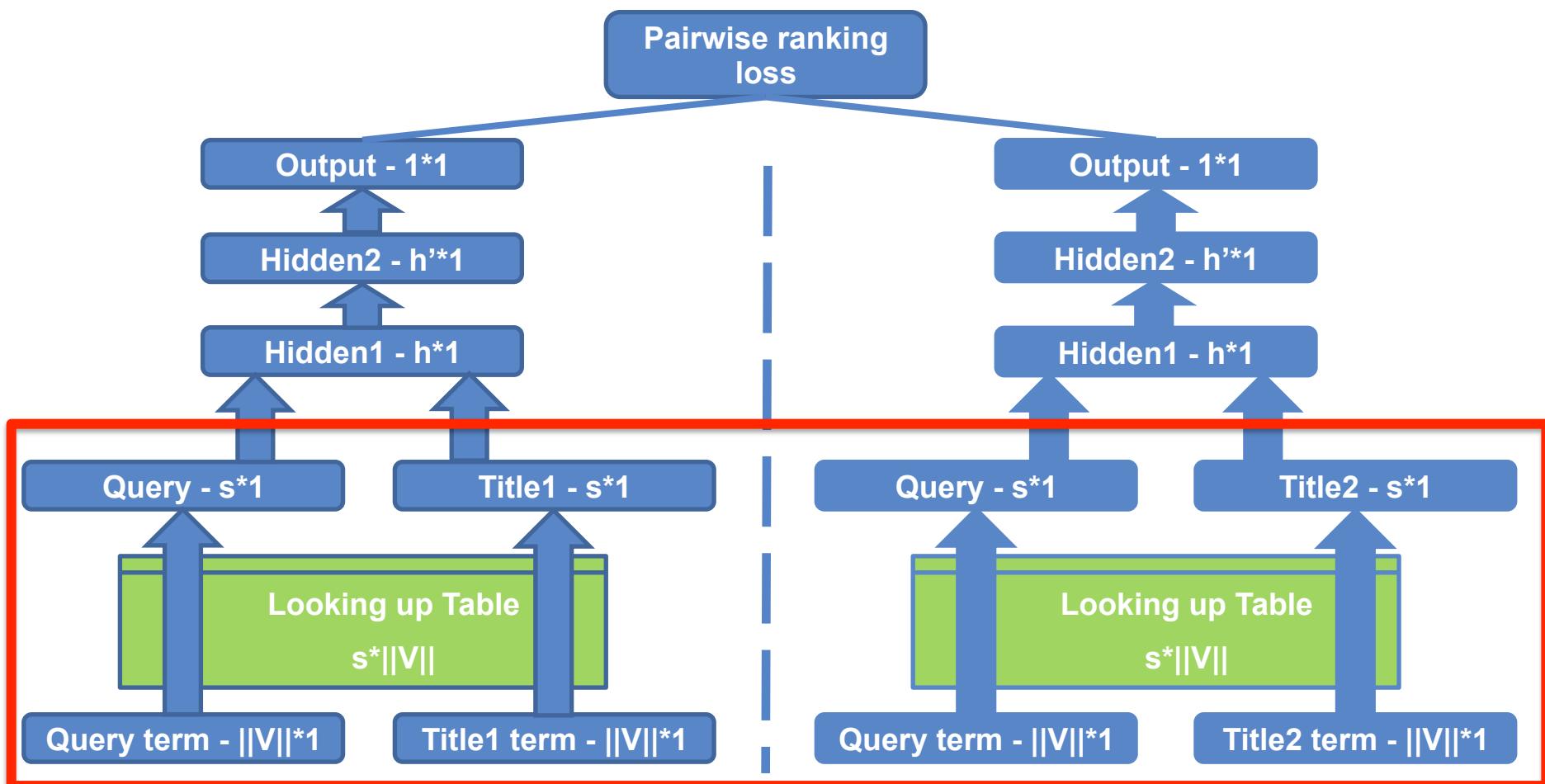


# Baidu's DNN model: increasing representation capability



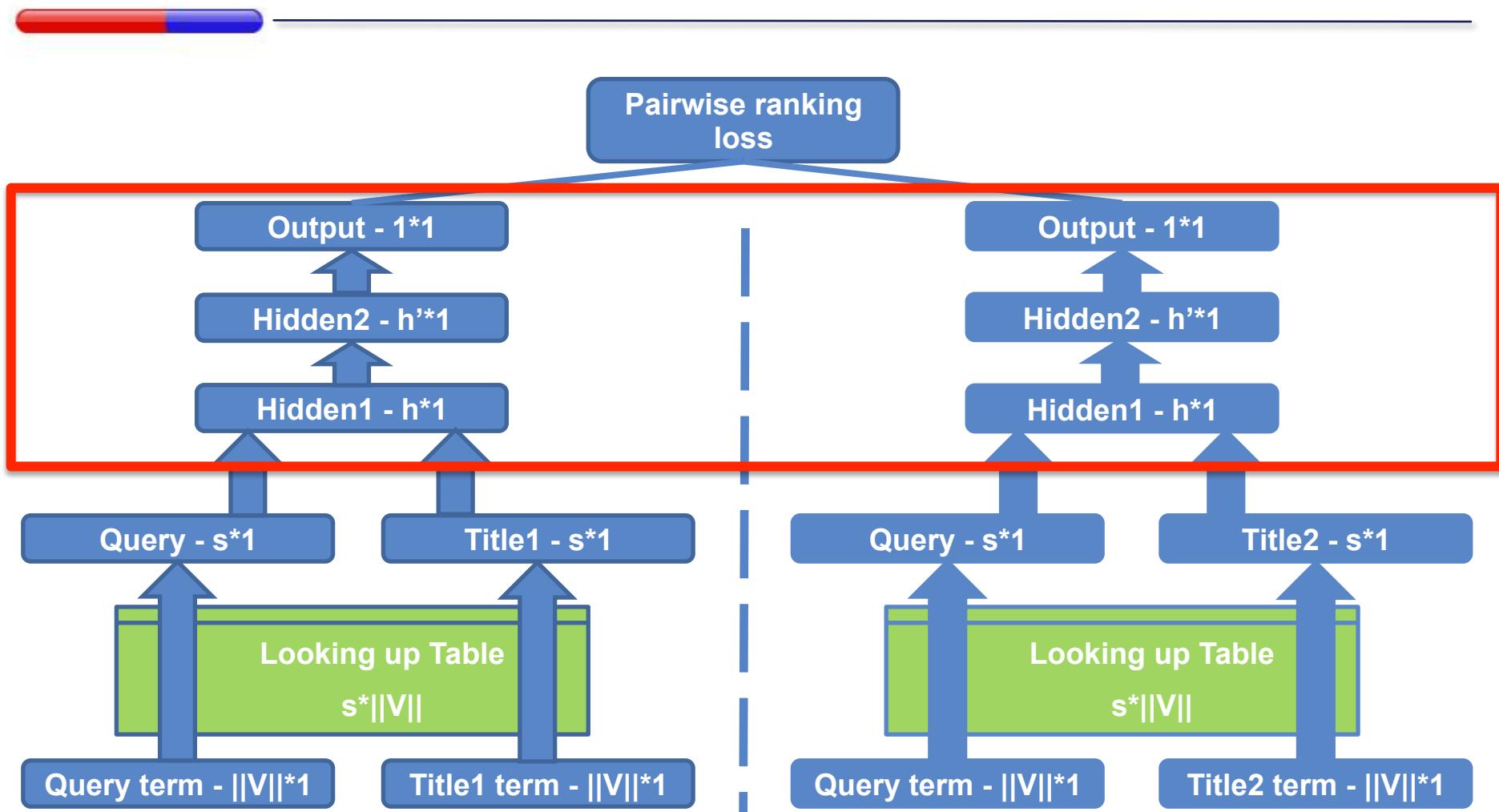
Model subtle semantic difference between clicked and not clicked docs.  
(Key difference with Gao's DSSM)

# Baidu's DNN model: increasing representation capability



Embedding layer: key to model like / hate relationship

# Baidu's DNN model: increasing representation capability



Similarity prediction: changing structure does not matter that much!

# Baidu's DNN model: increasing representation capability

---

- DNN model structure parameters do not matter that much!
- Models with similar representation capability have similar overall performance!
- The core improvement comes from label creation and the training data size!
- We just need an appropriate tool to memorize our data.

# DNN Case study: Q=Ghibli 车头如何放置车牌 (Before DNN model)

On Ghibli carhead how to place carplate

- Baidu results before we launched DNN model

[【图】Ghibli 玛莎拉蒂 Ghibli 报价 Ghibli 图片 汽车之家](#)



02月27日评测|离三叉戟最近的一次 试玛莎拉蒂Ghibli 02月06日导购  
都是高大上 2013年热门中大型车/豪华车 02月04日文化|流光溢彩大银幕 2014超级碗广告汇总 ...

[www.autohome.com.cn/3060/](http://www.autohome.com.cn/3060/) 2014-06-30 - 百度快照

[玛莎拉蒂Ghibli 百度百科](#)



玛莎拉蒂Ghibli为意大利汽车制造商玛莎拉蒂（Maserati）推出的车型，第一代于1967年面世，2013年4月于上海车展全球首次亮相的为Ghibli第三代车型，并与同年11月的广州车展上市...

[Ghibli三代历史 外观设计 基本参数 内饰设计 更多>>](#)

[baike.baidu.com/](http://baike.baidu.com/) 2014-05-03 -

[玛莎拉蒂Ghibli试驾 车吧 百度贴吧](#)



5条回复 - 发帖时间: 2013年6月20日

作为“总裁”的缩小版,4.97米长,Ghibli沿用了大量玛莎拉蒂的设计元素:车头又平...价140多W办下来160 比基础款总裁还高几万大洋...

[tieba.baidu.com/p/2406...](http://tieba.baidu.com/p/2406...) 2013-06-20 - 百度快照

Irrelevant!

# DNN Case study:

## Q=Ghibli车头如何放置车牌 (Google)

+On Ghibli carhead how to place carplate

Google search results for "Ghibli 车头如何放置车牌". The result is from auto.163.com.

网页 图片 视频 新闻 地图 更多 ▾ 搜索工具

找到约 46,000 条结果 (用时 0.38 秒)

[试玛莎拉蒂Ghibli S Q4 个性鲜明动力澎湃 \(全文\) \\_ 网易汽车](#)  
auto.163.com › 汽车频道 ›

2014年2月27日 - Ghibli车头的造型依旧是充满杀气，头灯的线条是玛莎拉蒂近来的设计趋势，进气格栅被进一步夸张，每个元素都彰显出Ghibli的运动与张扬。

[低售价吸引力十足实拍玛莎拉蒂Ghibli 车型图解- 车主之家](#)  
news.16888.com › 汽车导购 › 车型图解 ›

2014年3月17日 - 新款玛莎拉蒂Ghibli一经推出后，最低89.6万元的起步价一下子让更多的  
... 车头灯等线条设计同样有着玛莎拉蒂独有的特点，其采用了远近光一体式 ...

[玛莎拉蒂Ghibli于广州车展上市\[1\]- 时尚中国](#)  
auto.chinadaily.com.cn › 购车 › 新车 ›

2013年11月12日 - 融入LED日间行车灯的前大灯极为犀利，加上发动机盖上向后延伸的棱线与一体式的大型保险杠进气口，构成了Ghibli凶悍、动感的车头造型。

Irrelevant!

[玛莎拉蒂Ghibli对比路虎发现4 - 排骨榜推荐 - 微信](#)  
wx.paigu.com/u6745/a1311149.html ›

2013年12月3日 - [导语]玛莎拉蒂推出了全新一代的Ghibli,它以89.8万元的价格进入国内市场，... 玛莎拉蒂Ghibli车头造型参照新一代总裁，Ghibli在前隔栅造型上有所突破采用了更  
... 回复“0”查询美车在线最新报价回复“A”查询中规4s店豪华车品牌报价 ...

# DNN Case study:

## Q=Ghibli车头如何放置车牌 (After launching DNN model)

On Ghibli carhead how to place carplate



ghibli车头如何放置车牌

百度

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为你找到相关结果约6 800个

**【picture】 where to put Ghibli's front plate? Maserati forum CarHome forum**

**【图】 Ghibli的前牌照放哪里啊? 玛莎拉蒂论坛 汽车之家论坛**

12条回复 - 发帖时间: 2013年11月25日

Ghibli的前牌照放哪里啊?如题,坛子里的哪位大神知道?分享到: 回复楼主 ... 国彬 2013/11/25 1

9:01:05 发表在 4楼 前面有牌照架。这个是必须给顾客...

club.autohome.com.cn/b... 2013-11-25 ▼ V3 - 百度快照 - 82%好评

**【picture】 how to install Ghibli's frontside license? HELP Maserati forum CarHome forum**

**【图】 ghibli前面车牌怎么装?求助大虾 玛莎拉蒂论坛 汽车之家论坛**



8条回复 - 发帖时间: 2014年3月23日

ghibli前面车牌怎么装?求助大虾 好像就没设计装拍照的地方分享到

回复楼主 zhoupi\_sky LV 4 zhoupi\_sky 发信息 精华:0...

club.autohome.com.cn/b... 2014-03-23 ▼ V3

**【picture】 how to hang Ghibli's license? Maserati forum CarHome forum**

**【图】 Ghibli车牌咋挂? 玛莎拉蒂论坛 汽车之家论坛**



点击:3119 | 回复:2 玛莎拉蒂论坛 > **Ghibli车牌咋挂?**lczldm LV 5 lcld

m ... 这是放哪好呢。。 放心吧,宾利也没处挂,我们这小城市,A8警察  
就不管了,...

club.autohome.com.cn/b... 2013-12-03 ▼ V3

**【Ghibli2014款3.0T 手自一体正侧(车头向右)汽车图片-汽车...\_易车**



玛莎拉蒂Ghibli 参考成交价:83.80-140万 询最低价>> 贷款买车>> 图

片点评: 已有0条评论 沉默不是金,来一吐为快吧!(限5-140个字) 您还可

# DNN Case study:

## Q=ghibli 车头如何放置车牌 (After launching DNN model)

On Ghibli **carhead how to place carplate**



ghibli车头如何放置车牌

百度

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为你找到相关结果约6 800个

**【picture】 where to put Ghibli's front plate? Maserati forum CarHome forum**

**【图】 Ghibli的前牌照放哪里啊? 玛莎拉蒂论坛 汽车之家论坛**

12条回复 - 发帖时间: 2013年11月25日

Ghibli的前牌照放哪里啊?如题,坛子里的哪位大神知道?分享到: 回复楼主 ... 国彬 2013/11/25 1

9:01:05 发表在 4楼 前面有牌照架。这个是必须给顾客...

club.autohome.com.cn/b... 2013-11-25 ▼ V3 - 百度快照 - 82%好评

**【picture】 how to install Ghibli's frontside license? HELP Maserati forum CarHome forum**

**【图】 ghibli前面车牌怎么装?求助大虾 玛莎拉蒂论坛 汽车之家论坛**



8条回复 - 发帖时间: 2014年3月23日

ghibli前面车牌怎么装?求助大虾 好像就没设计装拍照的地方分享到

回复楼主 zhoupi\_sky LV 4 zhoupi\_sky 发信息 精华:0...

club.autohome.com.cn/b... 2014-03-23 ▼ V3

**【picture】 how to hang Ghibli's license? Maserati forum CarHome forum**

**【图】 Ghibli车牌咋挂? 玛莎拉蒂论坛 汽车之家论坛**



点击:3119 | 回复:2 玛莎拉蒂论坛 > **Ghibli车牌咋挂?**lczldm LV 5 lcycl

m ... 这是放哪好呢。。 放心吧,宾利也没处挂,我们这小城市,A8警察  
就不管了,...

club.autohome.com.cn/b... 2013-12-03 ▼ V3

**【Ghibli2014款3.0T 手自一体正侧(车头向右)汽车图片-汽车...\_易车**



玛莎拉蒂Ghibli 参考成交价:83.80-140万 询最低价>> 贷款买车>> 图

片点评: 已有0条评论 沉默不是金,来一吐为快吧!(限5-140个字) 您还可

# DNN Case study:

## Q=ghibli 车头如何放置车牌 (After launching DNN model)

On Ghibli **carhead how to place** carplate



ghibli车头如何放置车牌

百度

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为你找到相关结果约6 800个

**【picture】 where to put Ghibli's front plate? Maserati forum CarHome forum**

**【图】 Ghibli的前牌照放哪里啊? 玛莎拉蒂论坛 汽车之家论坛**

12条回复 - 发帖时间: 2013年

Ghibli的前牌照放哪里啊?如题

9:01:05 发表在 4楼 前面有牌

club.autohome.com.cn/b... 2013-12-03

**Q: 锐界车头雷达**

**D: 【图】 如何安装前雷达~\_锐界论坛\_汽车之家论坛**

**【picture】 how to install Ghibli's frontside license? HELP Maserati forum CarHome forum**

**【图】 ghibli前面车牌照怎么装?求助大虾 玛莎拉蒂论坛 汽车之家论坛**



8条回

ghibli

回复:

**Q: 触动精灵脚本如何放置**

**D: 触动精灵脚本在哪里 触动精灵脚本放哪里位置教程\_手机游戏**

**【picture】 how to hang Ghibli's license? Maserati forum CarHome forum**

**【图】 Ghibli车牌咋挂? 玛莎拉蒂论坛 汽车之家论坛**



点击:3119 | 回复:2 玛莎拉蒂论坛 > **Ghibli车牌咋挂?**lczldm LV 5 lcycl

m ... 这是放哪好呢。。 放心吧,宾利也没处挂,我们这小城市,A8警察  
就不管了,....

club.autohome.com.cn/b... 2013-12-03 ▼ V3

**【Ghibli2014款3.0T 手自一体正侧(车头向右)汽车图片-汽车...\_易车**



玛莎拉蒂**Ghibli** 参考成交价:83.80-140万 询最低价>> 贷款买车>> 图

片点评: 已有0条评论 沉默不是金,来一吐为快吧!(限5-140个字) 您还可

# DNN Case study

---

- 三岁小孩感冒怎么办

3 year old child caught a cold, what to do

- D1 : 三岁小孩感冒怎么办 | -15 3 year old child caught a cold, what to do
- D2 : 三岁小孩感冒怎么办\_宝宝树 | -13 3 year old child caught a cold, what to do - webMD
- D3 : 三岁小孩感冒怎么办\_搜房网 | -15.8 3 year old child caught a cold, what to do - redfin

# DNN Case study

---

- 三岁小孩感冒怎么办 3 year old child caught a cold, what to do
  - D1 : 三岁小孩感冒怎么办 | -15 3 year old child caught a cold, what to do
  - D2 : 三岁小孩感冒怎么办 宝宝树 | -13 3 year old child caught a cold, what to do - webMD
  - D3 : 三岁小孩感冒怎么办 搜房网 | -15.8 3 year old child caught a cold, what to do - redefin
- 宝宝感冒怎么办 Baby caught a cold, what to do
  - D1 : 宝宝感冒怎么办 | -15.8 Baby caught a cold, what to do
  - D2 : 小宝宝感冒怎么办 | -16.0 Small baby caught a cold, what to do
  - D3 : 狗宝宝感冒怎么办 | -17.03 Puppy baby caught a cold, what to do

# DNN Case study

---

- 三岁小孩感冒怎么办 3 year old child caught a cold, what to do
  - D1 : 三岁小孩感冒怎么办 | -15 3 year old child caught a cold, what to do
  - D2 : 三岁小孩感冒怎么办\_宝宝树 | -13 3 year old child caught a cold, what to do - webMD
  - D3 : 三岁小孩感冒怎么办\_搜房网 | -15.8 3 year old child caught a cold, what to do - redfin
- 宝宝感冒怎么办 Baby caught a cold, what to do
  - D1 : 宝宝感冒怎么办 | -15.8 Baby caught a cold, what to do
  - D2 : 小宝宝感冒怎么办 | -16.0 Small baby caught a cold, what to do
  - D3 : 狗宝宝感冒怎么办 | -17.03 Puppy baby caught a cold, what to do
- 少儿格言 Young baby motto
  - D1 : 幼儿格言 | -15.2 Child motto
  - D2 : 幼儿励志格言 | -15 Child encouraging motto
  - D3 : 幼儿教师格言 | -15.9 Child teacher motto

# Follow up questions

---

- Why not use end-to-end DNN model?
- What's the future directions after it?

# Follow up questions

---

- Why not use end-to-end DNN model?
  - Baidu's search ads model enjoy a lot from end-to-end DNN training.
  - Baidu's web search do not use end-to-end DNN training right now.
- What's the future directions after it?

# Difficulty of end-to-end DNN training in search

---

- Search's objective is **Human label**
  - Search ads's objective is (almost) CTR only. (10B training instances)
  - Search's objective is “Ideal ranking”: relevance, quality/authority, freshness, diversity
    - Only human label can measure that. (1M ~ 10M training instances)
- Search is **less tolerant to bad cases**
  - Search ads's objective is **average CTR** – total money we make.
  - Search's objective is “worst”, not “average”: **One** severe bad case can not be made up with **Ten** moderate good cases.
- Search needs much higher level of “**debugability**”
  - Search ads team do not really debug their model
  - If one query failed, search team need to know why, and **how** to improve this kind of queries.

# Potential benefits of end-to-end DNN training in search

---

- All basic representations are modeled with **big data** (user behavior).
  - Word segmentation
  - Query rewriting
  - Term weighting
  - Compound detection
  - ...
- Enable **inter-layer feedback** in model
  - Solve problem: improvement on Query rewriting not necessarily result in final ranking improvement.

# There is way to get some of benefits without DNN

---

- Refactor every basic components using **big data (user behavior)**.
  - Word segmentation; Compound detection
  - Query rewriting; Term weighting
- For example: Word Segmentation
  - Traditional algorithm: human label 10k ~ 100k sentences, use CRF
  - Baidu's algorithm:
    - ✧ Q = ABC
    - ✧ Clicked\_title = XABYZ
    - ✧ One week label on AB | C, however, we have 10B labels
  - Totally beat traditional algorithm

# Segmentation with Big Data

- Segmentation quality significantly improved

- Historical bad case solved:  $522 / 580 = 90\%$
- Diff segmentation SxS: Good : Same : Bad = 57% : 36% : 7%

New Segmentation					Old Segmentation				
东街口	吃	鱼			东街	口吃	鱼		
徒步二	分	工口	本		徒步	二分	工攻	口山	本新
绝世小攻	受	山	新		绝世	小小	攻受	山	
秦国治	兵				秦国	治兵			
宝鼎婚礼	五	十字绣			宝鼎	婚礼	五十	字绣	
横琴岛主导	风向				横琴	主导	风向		
幼儿园2010	年	年	计划		幼	园2010	年年		计划
收获奖	美术	作品			收	奖美术	作品		
吸引	扬	搏			吸引	力扬	搏		
e派	本机	软件	在	下载	e	本机	软件	在	下载
两数量积	数量	乘积	表示		两数	本量	积	表示	
杂粮面	的	成分			杂粮	的	成分		
重庆垫江	垫江	县	裴兴镇	民政	重庆	垫江	县	裴兴	镇民
深圳电信	机房	主	设备		深圳	电信	主	设备	
中国梦中职	生	篇			中国	梦中	生		
3个月大	金毛	除虫			3	个月	大金	除虫	
沙井美联	华采	仕			沙井	美联	华采		
昆山到成都	成都	转	动车		昆山	到成都	转	动	
深圳佳吉	西丽镇				深圳	佳吉	丽镇		
胃灼热	气	堵			胃	灼热	气		
哪国	土著	民族	最多		哪	国土	族	最	多
问美好	用	吗			问	美好	用		
福州至尚美	尚	妮可	老师		福州	至尚	美妮	可	
八大顺应	自然				八	顺应	美		
美航	行程单				美	航程	航		
你拍一我拍一	李天一	版			你	拍一	李	一	

## Follow up questions

---

- Why not use end-to-end DNN model?
- What's the future directions after it?

# Future directions – open questions

---

- Use bigger data; better label
  - Reflect other ranking aspects: authority/quality, freshness, diversity...
- Model short range dependency:
  - CNN: Baidu launched CNN model in search in Jan 2015 (substantial improvement)
  - Move basic granularity decision into holistic training?
- Model ambiguity from long distance dependency: apple, java
  - RNN: Potential answer but too much computation cost
  - Dynamically / Smartly select embedding when prediction?
- Better DNN debugability (SNE is not enough)
  - Design model structure, let parameters have physical meaning (i.e. Term weighting)?
- Also use embedding / NN prediction in retrieval phase
  - Instead of posting list, use asymmetric locality sensitive hashing?

# Summary: Baidu's DNN model

---

- Model higher level semantic aspects, happen to be a “fancy” model
  - Increasing representation capability can really help web search.
- If you have enough data, overfitting is not a bad thing
  - You just want to “memorize” (with representation capability) everything.
- If you have enough data, you can view classic problems differently
  - Word segmentation: improvement from data, not fancy algorithm.

# Challenges for Modern Search Engine

---

- Model relevance better
  - DNN / CNN / RNN + user behavior
- Provide answers directly
- Guide users thoroughly

# Challenges for Modern Search Engine

---

- Model relevance better
  - DNN / CNN / RNN + user data
- Provide answers directly
- Guide users thoroughly

## Challenge 2: Provide answer directly

---



With smaller and smaller screens, users want more **direct answers**, less blue links!

# One direction: Knowledge Graph inference

- Provide answers via inference on knowledge graph's ontology!



# Baidu provides answer: Subject + Predicate

Baidu 百度 新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多»  
刘德华的老婆

朱丽倩  
刘德华,妻子  
朱丽倩英文名字叫carol, 1966年4月6日出生在马来西亚槟城, 有5个兄弟姐妹。家境富裕, 父亲做地产和酒楼生意。1984年她和姐妹参... [详情»](#)  
来自百度百科 | 报错

[刘德华的老婆](#) 百度图片

约有108,000张[刘德华的老婆](#)相关的图片, 百度图片为您提供海量精美图片...

[image.baidu.com/i?word=刘德华的老婆](http://image.baidu.com/i?word=刘德华的老婆) ...2013-8-28

[刘德华的老婆](#)的相关视频 在线观看 百度视频



[查看全部4,656个相关视频>>](#)

[v.baidu.com/2013-8-28](http://v.baidu.com/2013-8-28)

[刘德华的妻子是谁](#) 百度知道

7个回答 - 提问时间: 2010年08月28日

最佳答案: 朱丽倩 个人简介 中文名: 朱丽倩 英文名: carol 家乡: 祖籍福

建诏安,生于马来西亚槟城 性别: 女 国籍: 马来西亚 ...

[zhidao.baidu.com/link?url=3\\_NLl0hpU1QvHAJ...](http://zhidao.baidu.com/link?url=3_NLl0hpU1QvHAJ...) 2010-9-4 [5](#)

Google andy lau's wife  
Web Images Videos News Shopping More Search tools

About 136,000 results (0.51 seconds)

## Carol Chu (m. 2008)

Andy Lau, Spouse

Feedback

[Images for andy lau's wife](#)

Report images



[More images for andy lau's wife](#)

[Andy Lau - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Andy\\_Lau](http://en.wikipedia.org/wiki/Andy_Lau) ▾

In 2008, Lau married Malaysian Chinese Carol Chu after 24 years of speculation over their relationship. The couple registered their marriage in Clark County, Nevada, in the United States. On 9 May 2012, Chu gave birth to his first child, a daughter named Hanna.

[Carol Chu, Andy Lau's Loyal Girlfriend and Wife for More ...](#)

[www.popularasians.com](http://www.popularasians.com/) › Home › Chinese News ▾

May 11, 2012 - Since the revelation that Andy Lau (刘德华) had married Carol Chu (朱丽倩) who was his girlfriend for over for over 20 years in 2008, the world ...

[Carol Chu Serving as Andy Lau's "Invisible" Woman for 24 ...](#)

[www.jaynestars.com/.../carol-chu-serving-as-andy-laus-invisible-woman-...](http://www.jaynestars.com/.../carol-chu-serving-as-andy-laus-invisible-woman-...) ▾

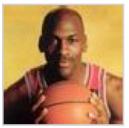
May 10, 2012 - An insider revealed that Andy Lau loved Carol Chu due to her .... I am

# Baidu provides answer: Predicate + Value range

Baidu 百度 新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多»  
182以上的篮球明星

## 182以上的篮球明星：

性别：[全部](#) [男](#) [女](#)

					
乔丹 198cm	林书豪 191cm	姚明 226cm	易建联 213cm	王治郅 214cm	德怀恩... 193cm
					
沙奎尔·奥... 216cm	林志杰 192cm	刘晓宇 191cm	勒布朗... 203cm	孙明明 236cm	肯扬-马丁 206cm

1 [2](#) [3](#) [4](#) [5](#) ... [64](#) [下一页](#)

报错

## 身高182以上的韩国男明星。 - 丝路女人 - 丝路花语 - 新疆最大...

9条回复 - 发帖时间: 2006年8月13日

丝路花语 论坛 【心灵驿站】 丝路女人 身高182以上的韩国男明星。12下一页 返回列表 发新帖

查看: 3696|回复: 10 身高182以上的韩国男明星。...

bbs.xj163.cn/thread-59539-1...html 2013-7-26 - 百度快照

## 175以上的中国男女明星? 百度知道

3个回答 - 提问时间: 2010年01月14日

知道达人: 星迷之王

最佳答案: 182 周杰... 185... 182 女明星: 梁咏琪身高: 175 于娜 身高: 176 瞿颖... 何润东, 瞿颖, 梁咏琪, 还有篮球, 排球的, 呵呵, 0 | 评论 2010-1-14 15:...

Google nba players taller than 6ft

Web Images Videos Shopping News More Search tools

About 385,000 results (0.91 seconds)

### Height in sports - Wikipedia, the free encyclopedia

[en.wikipedia.org/wiki/Height\\_in\\_sports](http://en.wikipedia.org/wiki/Height_in_sports)

In 2013, professional AFL players ranged 5 ft 8 in (1.73 m) to 6 ft 11 in (2.11 m). ... Yet, the average NBA Basketball player height is 6 foot 7 inches. .... Shorter quarterbacks also generally have a quicker release time than taller quarterbacks.

Wait ... Kevin Durant Is How Tall? « NBA.com | Hang Time ...  
[hangtime.blogs.nba.com/2013/01/31/wait-kevin-durant-is-how-tall/](http://hangtime.blogs.nba.com/2013/01/31/wait-kevin-durant-is-how-tall/)

Jan 31, 2013 - There's been players who measure darn close to 7-feet tall if not 7-feet .... LeBron is 6'8 and KD was a good 2 inches taller than him, he's was ...

### Active NBA players under 6 feet tall: - Message Board Basket...

[www.insidehoops.com](http://www.insidehoops.com) › ... › NBA Forum

Nov 12, 2013 - 16 posts - 10 authors

Active NBA players under 6 feet tall: NBA Forum. ... All of the other guys under 6 feet tall have an arm span greater than 6 feet, even Nate ...

Grizzlies commentator: "Clippers toughest player is 6 feet ..." 16 posts 24 Nov 2014

NBA height listing inconsistency thread 16 posts 13 Jul 2012

The NBA Artificially Inflating Player's Heights Is Getting ... 16 posts 22 Jun 2011

More results from [www.insidehoops.com](http://www.insidehoops.com)

### Some Bullshit Memes About Height - Box Score Geeks Articles

[www.boxscoregeeks.com/articles/some-bullshit-memes-about-height](http://www.boxscoregeeks.com/articles/some-bullshit-memes-about-height)

Jan 15, 2014 - We get it, NBA players are tall, and JJ is not. But stop ... Monta Ellis is 6ft 3 but his arms are shorter than average so he plays smaller than 6ft3.

### Anyone over 6-feet should be Banned from the NBA ...

<https://outlookzen.wordpress.com/.../anyone-over-6-feet-should-be-banned...>

Jun 1, 2014 - The number of over-6-feet people who became NBA players due to ... "Shorter people are less athletic than tall people, and therefore, deserve ...

LeBron James Height



# Baidu provides answer: Predicate + Nth



世界第五高峰

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约45,300,000个



世界第五高峰：

**马卡鲁峰 (高度 : 8463米)**

马卡鲁峰海拔8463米，位于喜马拉雅山脉中段，东经 $87^{\circ}06'$ ，北纬 $7^{\circ}54'$ ，其西北方向距珠穆朗玛峰24公里，沿西北—东南山脊为界，北侧在中国西藏境内，南侧在尼泊尔境内... [详情»](#)



世界第八高峰

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约10,000,000个



世界第八高峰：

**马纳斯鲁 (高度 : 8156米)**

马纳斯鲁峰又称马纳斯卢峰或库汤格峰，藏语意为平坦的地方，用以描述其宽大的顶部。 [详情»](#)



世界第十高峰

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约3,660,000个



世界第十高峰：

**安纳普尔纳峰 (高度 : 8091米)**

安纳普尔纳一号峰，海拔8090米，世界第10高峰。安纳普尔纳山脉主峰，又称库塘峰。安纳普尔纳峰（Annapurna），位于喜马拉雅山脉中段尼泊尔境内。 [详情»](#)

来自百度百科 | 报错

为您推荐：世界第九高山 世界第八高山 亚洲最高山



fifth highest mountain

Web Images Maps Videos News More Search tools

About 1,590,000 results (0.40 seconds)

## Makalu

**Makalu** (8481 m) is the fifth highest mountain in the world, located in the Greater Himalaya range on the border between China and Nepal. It towers in a distant region of Nepal that is particularly hard to reach, only 20 kilometers away from **Mount Everest**. Apr 2, 2013

**The expedition to Makalu (8481 m) – the fifth highest ...**  
[www.kingabaranska.com/.../expedition-makalu-8481-m—fifth-highest-...](http://www.kingabaranska.com/.../expedition-makalu-8481-m—fifth-highest-...)



eighth highest mountain

Web Images Maps Videos News More Search tools

About 712,000 results (0.40 seconds)

## Manaslu - Wikipedia, the free encyclopedia

[en.wikipedia.org/wiki/Manaslu](http://en.wikipedia.org/wiki/Manaslu) ▾

Manaslu (Nepali: मनास्तु, also known as Kutang) is the **eighth highest mountain** in the world at 8,163 metres (26,781 ft) above sea level. It is located in the ...



tenth highest mountain

Web Images Maps Videos News More Search tools

About 679,000 results (0.25 seconds)

**Mount Annapurna**, known to be the 10th highest mountain in the world, is a section of the **Himalayas** in north-central Nepal. The trek around the range is one of the most popular high-altitude treks in Nepal.

**The Ten Highest Mountains on Earth on Pinterest**  
<https://www.pinterest.com/wengerbrand/the-ten-highest-mountains-on-earth/>

# Baidu provides answer: Multi-step inference

The age of Nicholas Tse's father's son's ex-wife

  
The age of Nicholas Tse's father's son's ex-wife  
**34岁**

张柏芝 (Cecilia Cheung)，中国香港著名女演员、歌手。出生于香港油麻地。1998年被周星驰发掘，成为《喜剧之王》的女主角，由此一炮而红。因其形象清丽秀美，有着四分之... [详情>](#)

来自百度百科 | 报错

推理过程：

```
graph LR; A[谢霆锋] -- father --> B[谢贤]; B -- son --> C[谢霆锋]; C -- ex-wife --> D[张柏芝]
```

百度知识图谱真心强大 谢霆锋的前妻的儿子的爸爸的前妻的年龄



2013年8月22日 - 百度知识图谱真心强大 谢霆锋的前妻的儿子的爸爸的前妻的年龄 @康斯坦丁:2013年百度世界大会开的如火如荼,知识图谱正悄然上线,下一代搜索引擎雏形曝光...

[www.qiyue.com/yule/ht...](http://www.qiyue.com/yule/ht...) 2013-08-22 - 百度快照

beyonce's husband's wife's age

Web Images Videos News Shopping More Search tools

About 86,700,000 results (0.33 seconds)

## Beyoncé - Wikipedia, the free encyclopedia

[en.wikipedia.org/wiki/Beyoncé](http://en.wikipedia.org/wiki/Beyoncé) ▾

At age eight, Beyoncé and childhood friend Kelly Rowland met LaTavia Roberson .... Beyoncé performing "Baby Boy", which spent nine consecutive weeks at number .... and wife who learns of a woman's obsessive behavior over her husband.

## Jay-Z - Wikipedia, the free encyclopedia

[en.wikipedia.org/wiki/Jay-Z](http://en.wikipedia.org/wiki/Jay-Z) ▾

He claims in his lyrics that in 1982, at the age of 12, he shot his older brother in the .... Lenny Kravitz, and "Hovin Baby" were two successful radio singles as well. .... Jay-Z embraces wife Beyoncé after his performance of "Tom Ford" on The Mrs.

## Jay-Z lovechild: Does Beyoncé's husband have a secret son ...

[www.dailymail.co.uk/.../Jay-Z-lovechild-Does-Beyoncés-husband-secret-...](http://www.dailymail.co.uk/.../Jay-Z-lovechild-Does-Beyoncés-husband-secret-...) ▾

Sep 15, 2011 - Beyoncé's husband and the father of her unborn child Jay-Z reportedly has ... Not happy: Jay-Z's wife Beyoncé, who is currently pregnant with their child, ..... girlfriend of three years - a dancer turned actress who is half his age.

## Images for beyonce's husband's wife's age

Report images



More images for beyonce's husband's wife's age

## Jay z accused of lying about his age: beyonce's husband is ...

[www.ibtimes.co.in/jay-z-accused-of-lying-about-his-age-beyonc039s-h...](http://www.ibtimes.co.in/jay-z-accused-of-lying-about-his-age-beyonc039s-h...) ▾

Mar 26, 2014 - Beyoncé's husband and Rap king Jay Z has been accused of lying ... If

# Knowledge Graph: Inference

## 1. Apply Dependency Parsing on query



Whose son is Nicholas Tse



谢贤



狄波拉



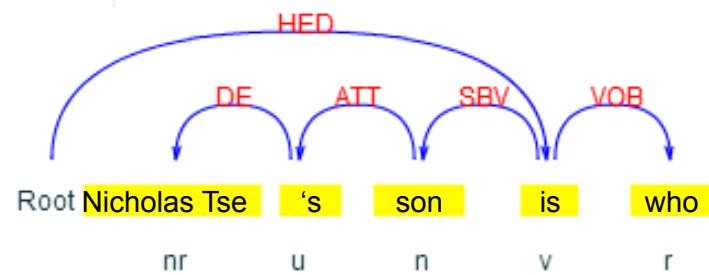
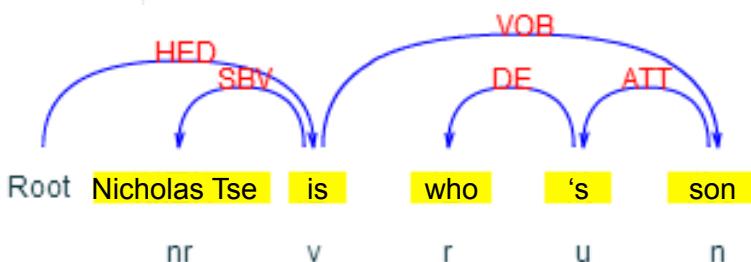
Who is Nicholas Tse's son



谢振轩

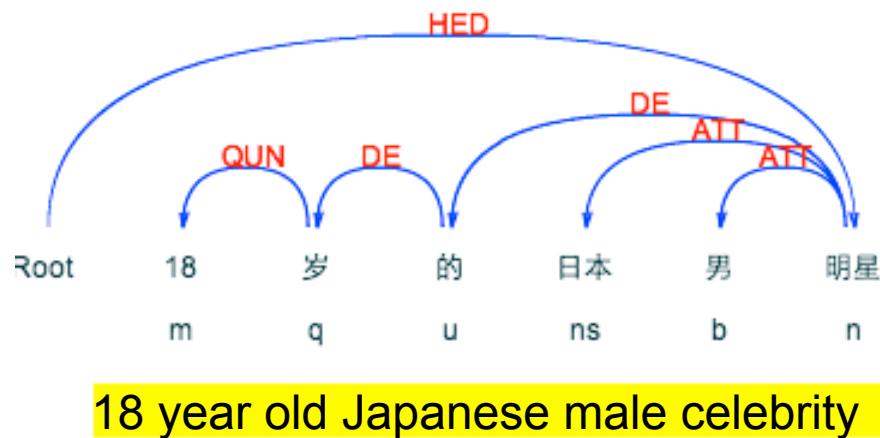


谢振南



# Knowledge Graph: Inference

1. Apply Dependency Parsing on query
2. Recursively Mapping parse tree into KG executable operations



E = Celebrity()  
E = Male(E)  
E = Japan(E)  
E = Age(E, 18)  
Return Top(E)

# Knowledge Graph: Inference

1. Apply Dependency Parsing on query
2. Recursively Mapping parse tree into KG executable operations
3. Query and Execute in KG

Baidu 百度 新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多»

18岁的日本男明星 18 year old Japanese male celebrity

18岁的日本男明星：



松村北斗 西井幸人 山崎贤人 羽生结弦 丹羽孝希 尼基

报错

# Knowledge Graph inference limitation 1

- Blindness: Knowledge graph we built are only on limited scope
  - [bush wives]

+KaiHua Search Images Maps Play YouTube Gmail Drive Calendar Translate More ▾

Google bush wives  Kai-

Web Images Maps Shopping More ▾ Search tools

About 18,400,000 results (0.31 seconds)

Laura Bush (m. 1977)  
George W. Bush, Spouse

'Bush wives' of rebels seek justice - The National  
[www.thenational.ae/news/world/africa/bush-wives-of-rebels-seek-justice](http://www.thenational.ae/news/world/africa/bush-wives-of-rebels-seek-justice) ▾  
Thousands of women abducted in Sierra Leone during civil war still bear the stigma of being associated with insurgents.  
You visited this page on 8/27/13.

BBC NEWS | Africa | Sierra Leone's forgotten 'bush wives'  
[news.bbc.co.uk/2/hi/5056654.stm](http://news.bbc.co.uk/2/hi/5056654.stm) ▾  
Jun 9, 2006 - African Perspective investigates why war-affected girls in Sierra Leone are turning to prostitution to survive.  
You visited this page on 8/27/13.

Bush Wives and Girl Soldiers: Women's Lives ... - Amazon.com  
[www.amazon.com/Books/History/Africa/Sierra-Leone](http://www.amazon.com/Books/History/Africa/Sierra-Leone) ▾  
Bush Wives and Girl Soldiers: Women's Lives through War and Peace in Sierra Leone [Chris Coulter] on Amazon.com. \*FREE\* super saver shipping or

The true figure is probably much higher, considering most

Sierra Leone's forgotten 'bush wives'

By Penny Boreham  
BBC African Perspective

Everyone you meet in Sierra Leone has a story to tell you about how the war affected them, or their family, and of the struggle to make a living and gain any quality of life in the peace.

But the enormity of the incidence of sexual abuse that occurred during the war is shocking.

Physicians for Human Rights has estimated that 64,000 women and girls were subjected to sexual abuse, mostly by the rebels but also by members of the armed forces.

Girls have not received as much post-war help as boys



# Knowledge Graph inference limitation 2

- User intention: entities has different user intent distribution

- [天龙八部] can be mapping to Novel, Game, TV, Movie, Song, etc.
- Which one does most users care when they mention it? In certain context?

天龙八部\_全集高清视频在线观看\_百度视频



已完结 共45集  
1997 | 中国香港 | 国语  
类型: 古装 | 剧情 | 动作  
简介: 乔峰追寻身世屡遭奸人所害，更错杀红颜知己阿朱，后又阿朱之妹阿紫而寻医至大辽国，辗转成为大辽国的南院大段誉之父是风流潇洒、处处留情的... [更多>>](#)

黄日华版 钟汉良版 胡军版 梁家仁版

1集 2集 3集 4集 5集 6集 7集 8集 9集 10集 11集 12集 13集 14集 15集

+ 显示全部  
[v.baidu.com](http://v.baidu.com)

天龙八部之天山童姥\_百度百科



《天龙八部之天山童姥》，是根据金庸武侠小说《天龙八部》的部分情节改编成的一部电影，由林青霞、巩俐、张敏、林文龙和徐少强等主演，1994年上映。其主要剧情为：巫行云（天山童姥）和李秋水、李沧海是武林天山派同门师姐妹，李秋水和李沧海同时暗恋上了同门师兄逍遙子，而逍遙子则爱上了李秋水的孪...

[剧情简介](#) [制作背景](#) [演员表](#) [角色介绍](#) [经典台词](#) [影评](#)

天龙八部\_高清视频在线观看\_乐视网



1982年上映 | 98分钟 | 香港 | 国语

豆瓣评分 5.7

导演: 萧笙

主演: 陈玉莲 徐少强 惠天赐 林珍奇

类型: 动作 | 古装 | 武侠

简介: 吐蕃国师鸠摩智往天龙寺讨六脉神剑秘籍，寺僧暗将秘籍交予段誉，誉紧记后毁之。鸠摩秘籍不遂，伤众... [更多>>](#)

立即播放 来源: 乐视

[www.letv.com](http://www.letv.com) 2015-01-25

天龙八部\_全集高清视频在线观看\_百度视频



已完结 共38集  
2013 | 内地 | 国语  
类型: 武侠  
简介: 北宋年间，辽、夏侵宋，天下第一大丐丐帮领导中原武林抗...  
豪气干云、武功卓绝的丐帮帮主乔峰，被康敏指为契丹人...  
被中原武林所不容。乔峰四处求证... [更多>>](#)

黄日华版 钟汉良版 胡军版 梁家仁版

1集 2集 3集 4集 5集 6集 7集 8集 9集 10集 11集 12集 13集 14集 15集 16集

天龙八部\_全集高清视频在线观看\_百度视频



已完结 共40集  
2003 | 内地 | 国语  
类型: 古装 | 武侠  
简介: 乔峰追寻身世时屡遭奸人所害，含冤莫白，更错杀红颜知己阿朱，后又为救阿朱之妹阿紫而寻医至大辽国，辗转成为大辽国的南院大王。但其与中原武林的关... [更多>>](#)

黄日华版 钟汉良版 胡军版 梁家仁版

1集 2集 3集 4集 5集 6集 7集 8集 9集 10集 11集 12集 13集 14集 15集 16集

+ 显示全部《天龙八部》胡军版 视频

[v.baidu.com/2015-01-25](http://v.baidu.com/2015-01-25)

【天龙八部】最新免费官方版下载】\_hao123下载站



2058.24M - 简体中文 - 免费软件

《天龙八部》是由搜狐畅游公司投入巨额资金，历时三年精心自主研发的武侠网游大作，极尽精良的美术制作、人性化的功能设计、忠实原著的剧情副本、新奇丰富的技能系统...

[soft.hao123.com/soft/appid/2608.html](http://soft.hao123.com/soft/appid/2608.html) 2014-09-11 - 百度快照

天龙八部单机版下载\_天龙八部游戏下载\_游迅网



↓ 下载地址 类型: 角色扮演 大小: 1.1GB

简介: 金庸原著《天龙八部》完全改编，玩家将大胆扮演“自己”，惊险走遍所有疑案，识得所有精彩角色！意想不到的自由玩法，天...

[www.yxdown.com/SoftVie...](http://www.yxdown.com/SoftVie...) 2012-07-30 V1

## Other direction to provide answer?

---

Only using Knowledge Graph inference is NOT enough!  
(Can only answer about 1%~2% of queries), we need  
other directions!

## Other direction: Knowledge Graph + Search

---

- Search can help on Blindness:
  - Search index is the biggest corpus we can have.
- Search can help on User Intention:
  - Search captures users' intention via all the ranking signals: anchors, titles, clicks, queries, refinements, location, dates, etc.
- Search provides context to KG.
- KG makes sense of search queries/results.



Currently, in Baidu's search infrastructure, KG entity and string term are equivalent first class citizens.

# Knowledge Graph + Search + KG entities: Online question answering – DeepQA



新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多»

Who is Gang Wang's second wife

Answer type: People

The photos of **Gang Wang** and his **first wife** were released Pretty daughter of high officials

**Gang Wang** and his **first wife's** joint photo, **Gang Wang** always is a quadraphonic Blaupunkt in entertainment world. He not only succeeded in acting, also failed in feeling. He married three times. For his **second wife**, singer **Fangyuan Cheng** and ...

[lady.people.com.cn/GB/133217...html](http://lady.people.com.cn/GB/133217...html) 2010-11-26 - 百度快照

The photos of **Gang Wang's second wife** Fangyuan Cheng

2013.01.07 - **Gang Wang** and famous singer **Fangyuan Cheng's** marriage has been the hot topic in entertainment world. However, they devoiced... **Gang Wang** recalled and said that the most happy time of him and Yuan is when they played 'The Sound of Music'. At that time, they ...

[www.5000wy.com/mingren/mingxing/246...](http://www.5000wy.com/mingren/mingxing/246...) 2013-1-7 - 百度快照

The photos of **Gang Wang** and his **third wife**, Singer Fangyuan Cheng is his **second wife**

**Gang Wang** always is a quadraphonic Blaupunkt in entertainment world. He not only succeeded in acting, also failed in feeling. He married three times. The feeling of him, his **second wife**, singer **Fangyuan Cheng** and his third wife **Yuandong Zheng** was known by ...

[www.ahtv.cn/ent/yuwen/mainland/2012/...](http://www.ahtv.cn/ent/yuwen/mainland/2012/...) 2012-11-22 - 百度快照

**Who's Gang Wang's second wife** - Tianya QA

1 post · 1 answer · The latest answer: 2009.07.17

Fangyuan Cheng, famous singer in China, nation's first class actor and committee member of China Music Association. Born in Beijing, 1960. At age of 17, she passed the examination of Central Conservatory of Music and studied to play tradition instrument, Erhu ...

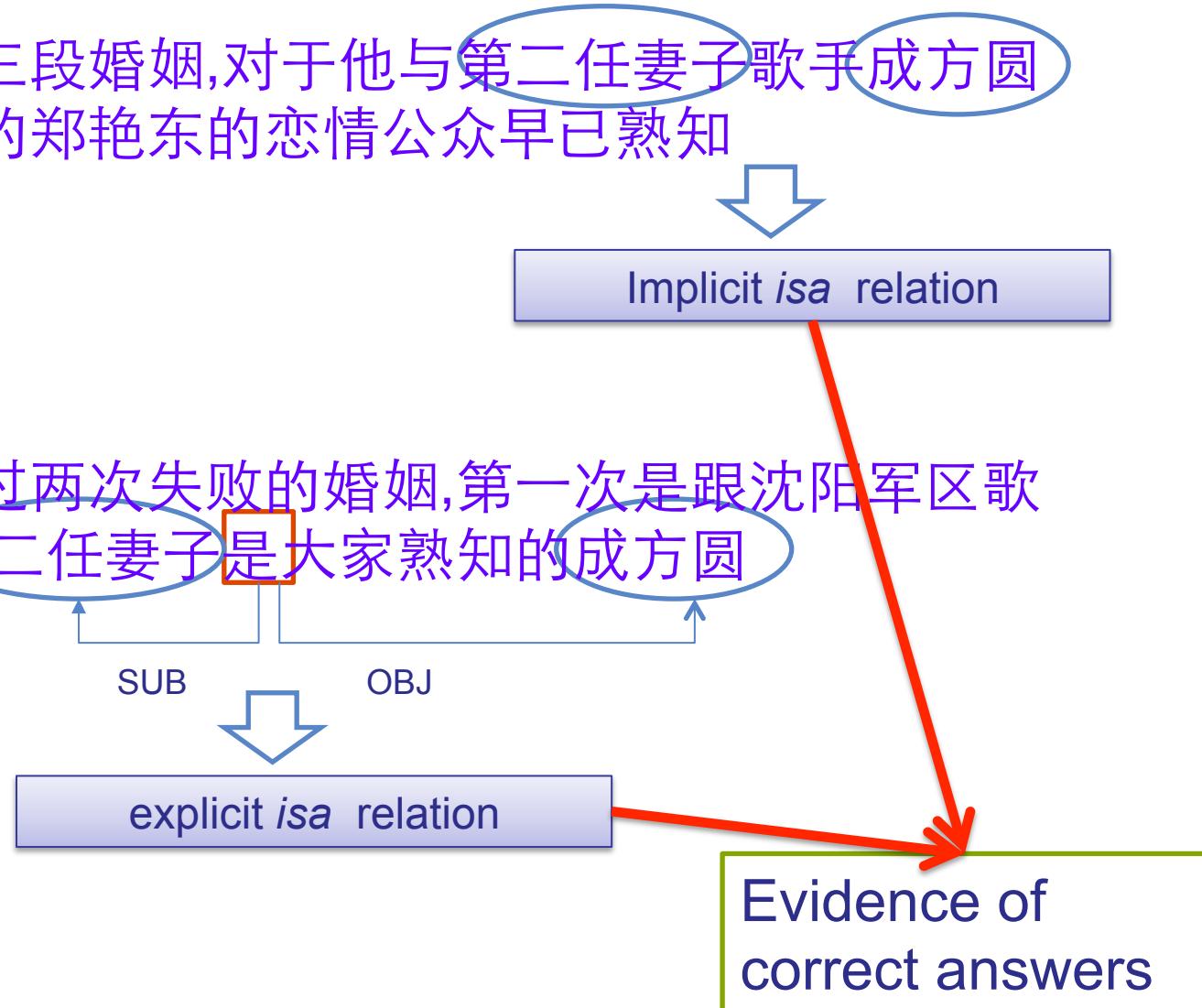
[wenda.tianya.cn/wenda/thread...?tid=616...](http://wenda.tianya.cn/wenda/thread...?tid=616...) 2010-9-20 - 百度快照

Best Answer:  
**Fangyuan Cheng (成方圆)**

# Knowledge Graph + Search + Structural Annotation: Online question answering – DeepQA

据悉王刚共有三段婚姻,对于他与第二任妻子歌手成方圆及第三任妻子的郑艳东的恋情公众早已熟知

王刚曾经历两次失败的婚姻,第一次是跟沈阳军区歌舞团的演员,第二任妻子是大家熟知的成方圆



# Knowledge Graph + Search + Sentiment Analysis: Online question answering – Answer clustering

- Better understanding search result using Sentiment Analysis:

[Can silk quilt be aired in the sun ? – solved – Sogou QA](#)

11 answers – latest one – 2010-2-10

Best Answer Had better not. Since silk is natural material, which contains colloid and many kinds of amino acids. If airing it in strong sun, silk is prone to be broken, the usage time will be shorted, the quilt will be shrunk too. ...

[wenwen.soso.com/z/q18...](#) 2010-02-19 - 百度快照 - 评价

[Can silk quilt be aired in the sun ?](#)

Answer Sure ... and should frequently airing it in the sun if possible. Silk quilt will be deflated after long-time usage, and will no longer be puffy. So airing it in the sun will help it recover. If possible, you had better renew it every year, and then it will have no difference to a new one ...

81%

YES

19%

NO

2006-05-10 回答者: iris9191 3个回答  31

## Answers of 'YES'

- [蚕丝被可以晒吗？\\_百度知道](#)

当然啦....而且有条件还要经常晒,蚕丝被睡久了就会比刚买来的时候要瘦,没那么松了,所以晒晒有助与它的蓬松度,如果可以最好是一年去那种专门翻蚕丝被的地方从新翻一下,那第二年再用就和刚买来的时候没太多区别了~~~

来自百度知道 | 2006-05-10

- [蚕丝被可以晒吗\\_百度知道](#)

可以的。。但1.避免强光直照,不要再烈日下暴晒,晒时不超过3小时, 2.蚕丝被最好就每隔一段时间拿出来晒下,不过晒的时候最好不要把被套拆下来,这样有被套挡住可以避免强光的照射,太阳猛烈的时候时间最好不... [显示全部](#)

来自百度知道 | 2011-12-13

# Knowledge Graph + Search: Online question answering – Long Answer

- For queries like [why sky is blue], user need long answer
- Automatically recognize potential best answer in top results

Baidu 百度 Why is the sky blue 百度一下

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约22,900,000个

Ask Why is the sky blue? Baidu Knows

Answer When the sun light goes through the atmosphere, the light with long wave lengths such as red light, can go through the air toward the ground; The lights with short wavelength such as purple, and blue light, meet with ice, water molecules, which always leads to scattering phenomena. The scattered purple, blue, cyan lights cover all over the sky, which makes the sky appear a piece of blue. From Baidu Knows

Why the sky is blue? 5 answers 2013-03-27

The reason why sky is blue? 6 answers 2011-05-01

More relative QA

天空为什么是蓝色的? | 答问 | 答问 | 果壳网 科技有意思

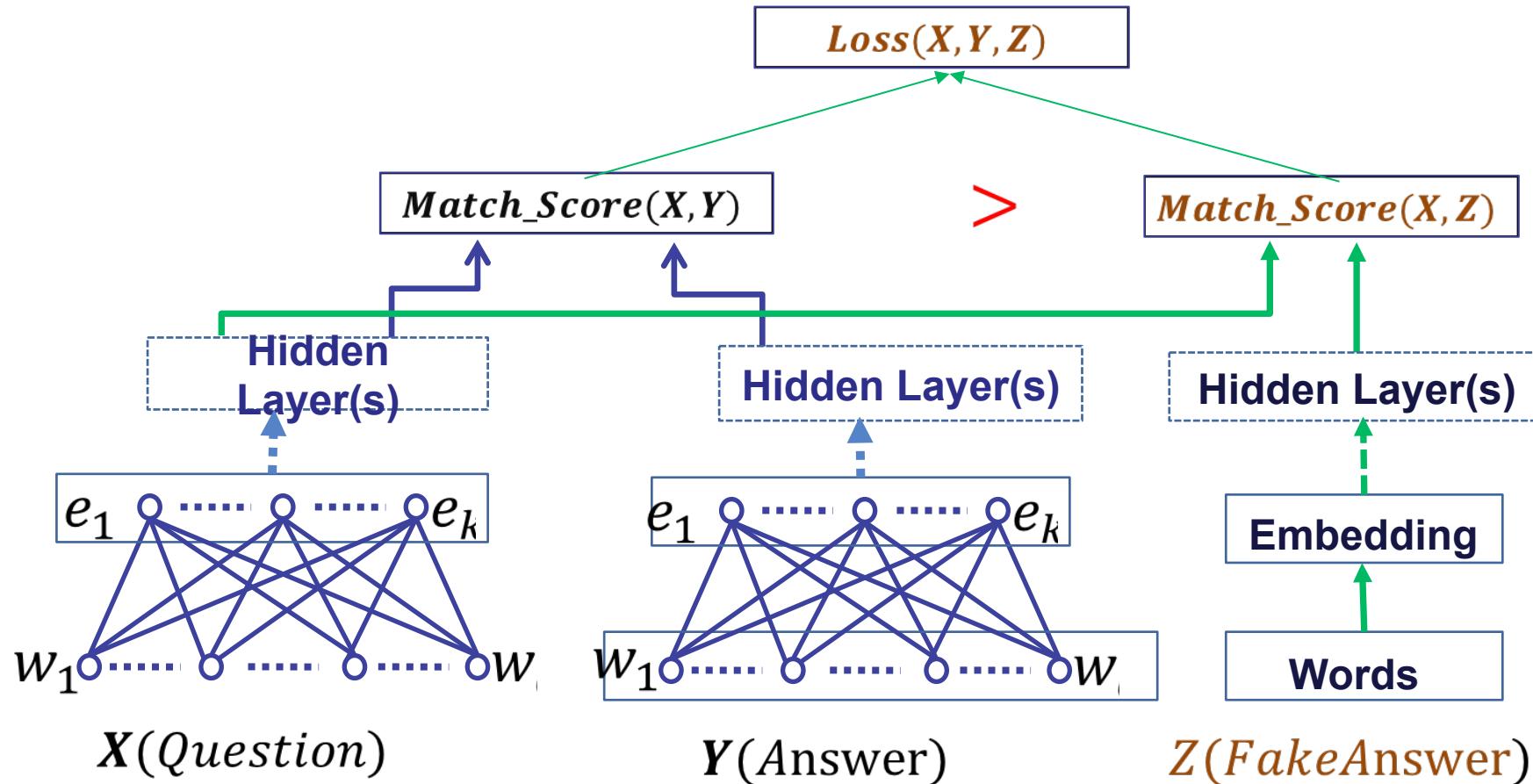
【原创】作者：亚特兰蒂斯的憧憬 - 来源：果壳网 - 发表时间：2012年06月30日

天空为什么是蓝色的？汇集知识碎片，创造有价值的答案... 天空为什么是蓝的？原因并不像常见的答案里说的那样，是由于“大气中的尘埃以及其他微粒散射蓝光的能力大于散...

High quality answer detection

# Knowledge Graph + Search: Online question answering – Semantic answer ranking

- Ranking Based on multi-level features: lexical, syntax and semantics



# Summary: Baidu's direct answers

---

- Baidu directly answer around 7% of user queries
  - KG inference answer: 1~2%
  - Long question answer: 2~3%
  - Answer clustering: 2~3%
  - DeepQA: 1%

# Challenges for Modern Search Engine

---

- Model relevance better
  - DNN / CNN / RNN + user behavior
- Provide answers directly
  - Knowledge graph + organic search + online algorithms
- Guide users thoroughly

# Challenges for Modern Search Engine

---

- Model relevance better
  - DNN / CNN / RNN + user behavior
- Provide answers directly
  - Knowledge graph + organic search + online algorithms
- Guide users thoroughly

## Challenge 3: Guide users thoroughly

---

With more and more touch interface, users want to **click more** and **type less**. We need to better **guide users throughout their session!**

# Usage difference: Ipad vs. PC

The screenshot shows a Baidu search results page for the query "网页搜索". The page includes:

- Sug Usage:** 1.26 (highlighted in green)
- Query Update:** 0.66 (highlighted in red)
- Right Side:** 1.25 (highlighted in green)
- Related Search:** 1.30 (highlighted in green)
- Next Page:** 1.30 (highlighted in green)
- Organic Result:** 0.88 (highlighted in red)
- Ads:** 1.02 (highlighted in green)

Key sections visible on the page include:

- Top Bar:** Includes a search input field with "网页搜索" and a blue "百度一下" button.
- Search Suggestions:** A sidebar with suggestions like "网页搜索快捷键", "网页搜索关键字", "百度网页搜索", and "网页搜索引擎优化".
- Promoted Links:** A section titled "推广链接" with links for "iPhone 6 手机" and "JD「京东」手机".
- Search Results:** A list of search results with titles like "按那个快捷键,可以在网页上直接搜索? 谢\_百度知道" and "百度网页搜索\_百度百科".
- Right Sidebar:** A sidebar titled "其他人的搜索" with links to various search engines and services.
- Bottom Navigation:** A footer with a navigation bar showing numbers 1 through 10 and a "下一页" button.

# Top Queries: Mobile vs PC

## Mobile

高圆圆赵又廷婚礼	Wedding of GaoYuanyuan & ZhaoYouting	1.00
深州地震	shenzhen earthquake	0.86
完美世界	perfect world	0.62
南宁砍人事件	knife attack in naning	0.62
大主宰	dazhuzai - a novel	0.49
我是有苦衷的	I have my difficulties	0.46
像普京一样强硬	be hard like Putin	0.42
赵本山骂战	zhaobenshan's war of words	0.41
莽荒纪	manghuangji - a novel	0.41
不要轻易登录陌生wifi	do not use strange wifi	0.40
绝世唐门	jueshitangmen - a novel	0.37
百度	baidu	0.30
习近平:惩治腐败	xijinping:fight against corruption	0.28
曼氏裂头蚴	sparganosis mansoni	0.25
火辣婚礼短片	short video of hot wedding	0.24
绝世武神	jushiwushen - a novel	0.23
山东五胞胎	quins in shandong	0.22
乘客零下52度推飞机	customers pushing a plane under 52 degress below zero	0.21

## PC

火影忍者	<a href="#">naruto</a>	1.00
优酷	youku	0.95
奔跑吧兄弟	running man - a show	0.92
淘宝	taobao	0.91
qq邮箱	qq mailbox	0.90
淘宝网	taobao	0.89
nba	nba	0.75
京东	jingdong	0.73
爱奇艺	iqiyi	0.72
12306	12306	0.65
163	163	0.64
风中奇缘	Fengzhongqiyuan - tv	0.64
电影天堂	heaven of movies	0.60
支付宝	alipay	0.59
翻译	translator	0.55
青年医生	young doctor - tv	0.54
lol	lol	0.54
亚马逊	amazon	0.50

# Guide user: homepage recommendation

The screenshot shows the Baidu mobile homepage. At the top, there's a status bar with signal strength, 3G connectivity, the time (上午5:36), battery level (86%), and a moon icon. Below the status bar is the Baidu logo. The main navigation bar includes links for News, Tieba, Novels, Videos, Websites, and More. A search bar is positioned above the 'Real-time Hotspots' section. The 'Real-time Hotspots' section is highlighted with a red dashed border and contains two rows of items. The first row includes '北京小伙和地...' (Beijing boy and land...) and '马达加斯加暴...' (Madagascar暴...). The second row includes '毒枭驾车撞警察' (Drug lord driving car撞警察) and '成品油消费税提高' (Expenditure tax on refined oil increased). At the bottom of this section is a blue button labeled '再来一批' (More batches). The footer features icons for Baidu, Discovery, Me, and More.

高圆圆赵又廷婚礼	Wedding of GaoYuanyuan & ZhaoYouting	1.00
深圳地震	shenzhen earthquake	0.86
完美世界	perfect world	0.62
南宁砍人事件	knife attack in naning	0.62
大主宰	dazhuzai - a novel	0.49
我是有苦衷的	I have my difficulties	0.46
像普京一样强硬	be hard like Putin	0.42
赵本山骂战	zhaobenshan's war of words	0.41
莽荒纪	manghuangji - a novel	0.41
不要轻易登录陌生wifi	do not use strange wifi	0.40
绝世唐门	jueshitangmen - a novel	0.37
百度	baidu	0.30
习近平:惩治腐败	xijinping:fight against corruption	0.28
曼氏裂头蚴	sparganosis mansoni	0.25
火辣婚礼短片	short video of hot wedding	0.24
绝世武神	jushiwushen - a novel	0.23
山东五胞胎	quins in shandong	0.22
乘客零下52度推飞机	customers pushing a plane under 52 degress below zero	0.21



## Guide users thoroughly

---

- Fully exploit session data
- Stop treating search result page as static

## Guide users thoroughly

---

- Fully exploit session data
- Stop treating search result page as static

# Guide user: suggestion for empty box

## Step 1 Search “Baidu Stock”

百度股价

百度一下

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

百度为您找到相关结果约39,100,000个

百度[BIDU]\_美股实时行情\_新浪财经  
230.81 ↓ -0.32 (-0.14%)  
2014-12-04 16:00:00 已收盘 (美东时间)

道琼斯: 17900.10 (-0.07%)  
纳斯达克: 4769.44 (-0.11%)

235.05 今开 232.19  
233.70 昨收 231.13  
232.35 最高 234.70  
231.00 最低 229.93  
229.65 成交量 240.88万  
09:30 11:00 12:30 14:00 16:00  
市盈率 39.12

## Step 2 Remove the query from input box and you will get related stocks

百度一下

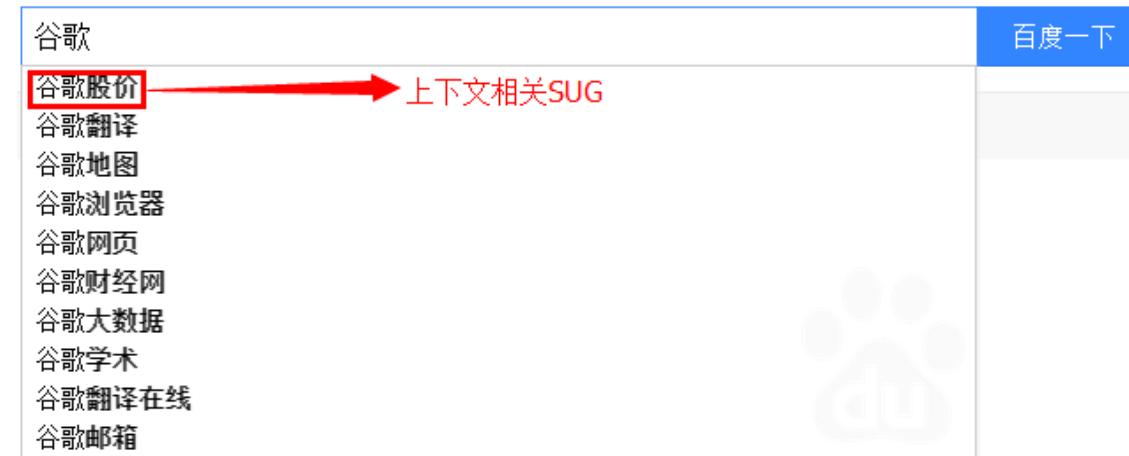
- 腾讯股价
- 京东股价
- 360股价
- 谷歌股价
- 唯品会股价
- 阿里巴巴股价
- 苹果股价
- 新东方股价
- 美元对人民币汇率
- 新浪股价

# Guide user: Session-aware suggestion

## Step 1 Search “Baidu Stock”



## Step 2 Type in “Google” and you will get “Google Stock”



# Guide user: Session-aware suggestion

prequery: 淘宝

Shengtong  
(Chinese fedex)

1. 申通
2. 顺丰
3. 申通快递单号查询
4. 世界杯
5. 苏宁易购
6. 苏宁
7. sina
8. steam
9. skype
10. sina邮箱

1. sina
2. steam
3. skype
4. sina邮箱
5. s4
6. sony
7. shinee
8. super junior
9. snh48
10. sd敢达

Taobao (Chinese amazon)

Shunfeng  
(Chinese EMS)

Shuning  
(Chinese bestbuy)

prequery: nba

Linsanity  
(NBA player)

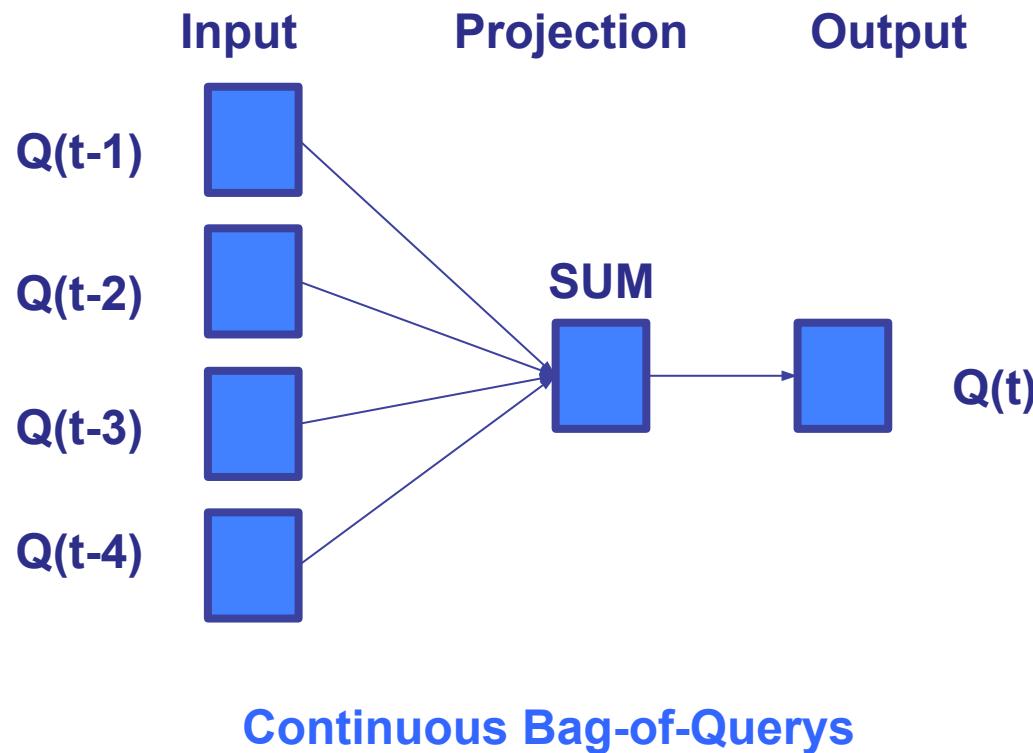
1. 林书豪
2. 林书豪成名战完整版
3. 林志颖
4. 灵魂摆渡
5. 林心如
6. 李娜
7. 林允儿
8. 林宥嘉
9. 林正英
10. 林志玲

1. 林志颖
2. 灵魂摆渡
3. 林心如
4. 李娜
5. 林允儿
6. 林宥嘉
7. 林正英
8. 林志玲
9. 灵域
10. linux

Chinese  
celebrities  
with family  
name Lin

# Fully exploit session data

- Similar to word2vec, we use query2vec
  - 5M queries, 10B training data



# Guide user: Right side recommendation



Yucheng Tian

百度一下

推荐:看世界杯，人人有礼，赢家通吃

[Yucheng Tian, Baidu online encyclopedia](#)



Name: Yucheng Tian  
Birth: 2008.4.15

Cindy, born in Fuzhou City, Fujian Province, her ancestors' home locates at Chongqing City. The daughter of Liang Tian who is a former national player and a current actor and Yiqian Ye who is an actress. In 2013 Oct, [Yucheng Tian](#), with her father ...

[Family](#) [Life](#) [Work](#) [Program](#) [Others](#) [more>>](#)

[baike.baidu.com/ 2014-06-23](#)

[田雨橙\\_海量精选高清图片\\_百度图片](#)



田雨橙: 全部 节目

[image.baidu.com](#) - 查看全部180,000张图片

[田雨橙吧\\_百度贴吧](#)

6万个田雨橙的粉丝在这里聚集



[微博更新贴](#) [多图](#) [精](#)

这里记录cindy的点点滴滴。和大家...  
帖子名称是以前的删了重新开一个新...  
你幸福祝你好 加精萌哒哒...

Anticipate users' actions:  
recommendation of related  
entities

## Related Person



叶一茜

Dad, where are we going  
Cindy's Mama



郭子睿

Dad, where are we going  
Brave little man



王诗懿

Dad, where are we going  
Lovely girl



小小志

Dad, where are we going  
Mr. Right



林妙可

The most popular child star in 2009



李湘

Dad, where are we going  
TiTian's Mama



张悦轩

Dad, where are we going  
Mr. Right



张真

Dad, where are we going  
Mr. Right



田亮

Dad, where are we going  
Cindy's Papa



陈若仪

magnum opus  
Order underground



张籽沐

Child star in China



李昆

Actor in China mainland

风一样的国际森

# Guide user: Right side recommendation - evidence

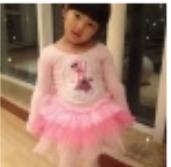
相关人物



叶一茜  
爸爸去哪儿  
森碟麻麻



郭子睿  
爸爸去哪儿  
勇敢的爷们



王诗龄  
爸爸去哪儿  
可爱萌娃



小小志  
爸爸去哪儿  
黑米哥哥



Miaoke Lin  
The most popular child star in 2009



李湘  
爸爸去哪儿  
恬恬麻麻



张悦轩  
爸爸去哪儿  
小暖男



Liang Zhang  
Dad, where are we going  
New Mr. Right



田亮  
爸爸去哪儿  
森碟粑粑



陈若仪  
代表作品地  
下秩序



张籽沐  
中国童星



李晟  
中国大陆演员

展开 ^

In 2010, Miaoke Lin published total 7 singles. In the same year, she participated the movie '37', and played the role of childhood Dayu Lin in 'Red Mansion', Shaohong version. She won 'Most popular child star 2009', 'Promotion ambassador of Beijing city flower', and 'Top 10 young pioneers in Dongcheng district, Beijing', etc.

Evidence extraction

Liang Zhang was promoted to new Mr. Right all-around



2013年12月10日，张亮是“爸爸去哪儿”走出来的信一代男神，张亮高大帅气多金，会做饭。... 一脚跨出时尚圈，全方位晋升顶级新男神。顶级新男神张亮 带着...  
[fashion.163.com/13/12...](http://fashion.163.com/13/12...) 2013...

Evidence compression

## Guide users thoroughly

---

- Fully exploit session data
- Stop treating search result page as static

# After-click recommendation

- When user click a result, and go back to Baidu search result page, give them recommendation related to this result.

**Baidu 百度** 新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多» **Baidu 百度** 新闻 网页 贴吧 知道 音乐 图片 视频 地图 文库 更多»

港澳通行证几天能办下来

How long can I get HongKong visa

问 港澳通行证一般多久能办下来?\_百度知道

答 正常是十五个工作日(周一到周五算工作日),也可以留地址,证件出来后,直接快递给你(另外收费) [详情>>](#)

来自百度知道 | 报错

请问港澳通行证最快几天能办下来? 5个回答 2009-05-23  
港澳通行证多久可以办下来 1个回答 2014-01-03  
[更多相关问答>>](#)

着急在线等答案!!现在办理港澳通行证,几天能办下来啊!!

14条回复 - 发帖时间: 2010年3月20日  
前辈们啊 港澳通行证最快几天可以办下来啊 !!因为和朋友凑到一起去自由行 可是我通行证还没办!!能不能告诉我啊 这样我们可以提前订机票!!官方回答是15个...  
[www.19lou.com/forum-11...](http://www.19lou.com/forum-11...) 2011-11-24 -  - 百度快照 - 84%好评

为您推荐: 港澳通行证有效期

HongKong visa validation period

发财树的养殖方法和注意事项

发财树的养殖方法和注意事项大全



发财树养殖的【温度】、【湿度】、【光照】.....【病虫防治】你知道吗?我们为你详细介绍[发财树的养殖方法和注意事项大全](#)。  
[facaishu.zhuqike.com/](http://facaishu.zhuqike.com/) 2014-05-15 - 百度快照

为您推荐: 绿萝 平安树 富贵竹 发财树多久浇一次水 富贵树 吊兰

宝宝坐飞机用什么证件?-丫丫网 生活闲聊版

What document do a baby need to take a plane?

我们宝宝集体户口,没有户口本。需要奶奶带着坐飞机,所以过来问问有经验的MM们:[宝宝坐飞机要什么证件?](#)用出生证的话,要和爸爸妈妈的身份证一起出示吗?还有有MM给...  
[sh.yaya.com/talk/30/1...](http://sh.yaya.com/talk/30/1...) 2010-12-04 - 百度快照 - 83%好评

为您推荐: 婴儿坐飞机注意事项 婴儿坐飞机要买票吗 婴儿坐飞机 证件

Infant take a plane matters needing attention

# Scroll-up recommendation

- When user scroll up in their result page, we have a drop down recommendation to clarify user query.

A screenshot of a Baidu search results page for the query "凯特". At the top, there is a red box highlighting a dropdown recommendation box. Inside the box, it says "为您推荐:" followed by four suggestions: "凯特王妃", "凯特贝金赛尔", "凯特温斯莱特", and "凯特·温斯莱特". Below this, there is a blue button labeled "百度一下".

The first search result is for "凯特·温斯莱特 百度百科". It features a thumbnail image of Kate Winslet. The snippet text reads: "凯特·温斯莱特(Kate Winslet),1975年10月5日出生于英国伯克郡,英国影视女演员。1994年参演首部电影《罪孽天使》开启演艺生涯。1995年参演华人导演李安执导的电影《...》". Below the snippet is a green link: "baike.baidu.com/link?u... 2014-07-22" and a blue "V3" icon.

The second search result is for "凯特·米德尔顿 百度百科". It features a thumbnail image of Kate Middleton holding a parasol. The snippet text reads: "凯特·米德尔顿(Kate Middleton ),1982年1月9日出生,是英国王子威廉王子的妻子。英国社会各界对凯特的评价也是褒多于贬,民众普遍评价凯特是个温和、智慧的王妃。...". Below the snippet is a green link: "baike.baidu.com/link?u... 2013-12-26" and a blue "V3" icon.

The third search result is for "凯特·布兰切特 Cate Blanchett". It features a thumbnail image of Cate Blanchett standing next to an Academy Award statue. The snippet text reads: "凯特·布兰切特介绍、图片及作品列表... 第86届奥斯卡金像奖 凯特·布兰切特后台采访 凯特·布兰切特后台采访 03:18 金球奖红毯 凯特·布兰切特专访 凯特·布兰...". Below the snippet is a green link: "people.mtime.com/924320/ 2010-11-15" and a blue "V3" icon.

A scroll-up recommendation for "凯特" is shown. It includes a thumbnail image of a promotional banner for a 2015 event. The snippet text reads: "现在机会来了,台州凯特比亚迪是全国最大的比亚迪集团之一现协旗下、台州凯特店(泽国)、台州大禹店(椒江)、台州恒之迪店(临海)、台州恒广店(玉环)、...". Below the snippet is a green link: "太平洋汽车网 6天前". To the right of the recommendation, there is a large blue vertical arrow pointing upwards.

# Browsing mode

Baidu 百度

新四大天王

百度一下

百度首页 消息(1) 设置 朱凯华 search

网页 新闻 贴吧 知道 音乐 图片 视频 地图 文库 更多»

张学友 > 相关人物 > 新四大天王

张国荣复活 田馥甄 刘向蕙 卓别林 新四大天王 李晨 angelababy 林正宏 房祖名

新四大天王\_百度百科

华语流行乐坛面临改朝换代，2012年华语**新四大天王**确立为周杰伦、王力宏、林俊杰、罗志祥。周杰伦，世界十大鬼才音乐人之一，亚洲流行音乐天王，出道十四年十五度夺下金曲奖项，...

**新天王** **专辑销量** **事业发展** **天王履历**

baike.baidu.com/ 2015-02-03 ▼

亚洲新四大天王\_百度图片 - 举报图片

image.baidu.com ▼ - 查看全部12,277张图片

看了新四大天王排名被吓尿。。\_李毅吧\_百度贴吧

17条回复 - 发帖时间: 2014年2月18日

看了**新四大天王**排名被吓尿。。只看楼主 收藏 回复等雨说放弃jay 闹太~套... 狗屁天王,是拿伞拿琵琶还是拿宝塔,戏子伶人而已...

tieba.baidu.com/p/2874... 2014-02-18 ▼ - 百度快照

相关人物 展开 ▼

四小天王 娱乐圈最神的神话

四大小生 内地版四大金刚演员

四小天后 四位台湾女歌星统称

林俊峰 林俊杰的哥哥

赵本水 硬气功口技乐器演员

四大花旦 中国大陆影视

香港四小龙 功夫电影开创者

巨兴茂 无名分但比影帝还牛

其他人还搜 展开 ▼

Baidu 百度

# Summary: Baidu's UI change

---

- Percentage of Baidu's traffic from:
  - Right side recommendation: X %
  - After click + Scroll up recommendation + browsing mode: Y %
  - Context aware suggestion: Z %
- X% + Y% + Z% is around 8%

# Challenges for Modern Search Engine

---

- Model relevance better
  - DNN / CNN / RNN + user behavior
- Provide answers directly
  - Knowledge graph + organic search + online algorithms
- Guide users thoroughly
  - Session data + query2vec + dynamic search result page

# Summary: Baidu's answer to these challenges

---

- Model relevance better
  - DNN / CNN / RNN + user behavior
  - Around 30% of total 2013, 2014 relevance improvement
- Provide answers directly
  - Knowledge graph + organic search + online algorithms
  - Answer 7% of Baidu's queries
- Guide users thoroughly
  - Session data + query2vec + dynamic search result page
  - Guide around 8% of Baidu's traffic

Everything I mentioned are launched on Baidu search



Thanks for your time!

All the work belongs to entire Baidu  
Web Search Team!

# Advertisement ^\_^

---

- In Baidu:
  - Full of interesting problems in real world
  - Full of freedom to try your ideas
  - A real system used by billions of people every day
  - A lot of great engineers / researchers
  
- Plenty of opportunities in Baidu:
  - Career opportunity
  - Internship opportunity
  - Visiting opportunity
  - Mailto: [wuxiaohui@baidu.com](mailto:wuxiaohui@baidu.com)



**WE WANT YOU**

Bai<sup>du</sup> 百度